

Chapter 14

Study Guide

Name: _____

Date: _____ Per: _____

Directions:

1. **Label each of the following characteristics as belonging to an acid (A) or (B).**

a. feels slimy		g. $[H^+] > [OH^-]$	
b. turns litmus blue		h. tastes bitter	
c. turns phenolphthalein pink		i. turns litmus pink	
d. has a pH greater than 7		j. has a pH less than 7	
e. neutralizes bases		k. tastes sour	
f. reacts with metal to form $H_2(g)$		l. neutralizes acids	

2. An acidic solution is characterized by having a higher _____ than _____. Bases have a higher _____ than _____. In neutral solutions, these concentrations would be equal.
3. Svante Arrhenius defined acids as substances that _____ in aqueous solution and bases as substances that _____ in aqueous solution. His theory only pertained to substances dissolved in water. Generally, the formula of an Arrhenius acid begins with the letter _____, denoting the hydrogen ion(s) being ionized. Bases typically will end with _____, the formula of the hydroxide ion. His theory explained why _____ and _____ are produced in a neutralization reaction.
4. The Brønsted-Lowry theory of acids and bases relates to the donation/acceptance of a(n) _____. Acids are defined as substances that _____ and bases as substances that _____. Brønsted-Lowry bases always have _____ to bond with the “accepted” proton since it has no _____ of its own. The use of the terms “donated” and “accepted” are commonly used to describe Brønsted-Lowry acids/bases, but really the proton is ripped from the acid in a process called _____. The ease with which the proton is torn from the acid relates to the _____ of the bond holding the proton to its conjugate base. The greater the polarity of the bond, the _____ acid.
5. Name the following acids.
- | | |
|-----------------------|-------------------------|
| a. HClO _____ | h. $H_2C_4H_4O_6$ _____ |
| b. $HC_2H_3O_2$ _____ | i. H_2S _____ |
| c. HCl _____ | j. H_2O _____ |
| d. CH_3COOH _____ | k. H_3PO_4 _____ |
| e. HNO_3 _____ | l. H_3N _____ |
| f. HBr _____ | m. H_2SO_3 _____ |
| g. HNO_2 _____ | n. HI _____ |
6. A strong acid _____ in water, whereas a weak acid _____ in water. The strength of an acid can be represented mathematically using the acid-dissociation constant, _____. The higher the value of _____, the stronger the acid. The strong acids are: _____, _____, _____, _____, _____, _____, and _____. Equations representing strong acids have a _____ arrow, whereas equations for weak acids have a _____ arrow.

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7. Write the ionization equation and acid ionization constant expression for the acid HIO_3 .
8. Acetic acid is a weak monoprotic acid. It is the active ingredient in vinegar. If the initial concentration of acetic acid is 0.200 M and the equilibrium concentration of H_3O^+ is 0.0019 M , calculate K_a for acetic acid.
9. Cyanic acid is a weak monoprotic acid. If the initial concentration of cyanic acid is 0.150 M and the equilibrium concentration of H_3O^+ is $4.8 \times 10^{-2}\text{ M}$, calculate K_a for cyanic acid.
10. A strong base _____ in water, whereas a weak base _____ in water. The strength of a base may be quantified using the _____, K_b . The higher the value of K_b , the _____ of the base. Strong bases are typically _____ and include the following: _____, _____, _____, _____, _____, _____, _____, and _____. Weak bases generally have _____ bonds.
11. Write the ionization equation and base ionization constant expression for the base COOH^- .
12. Acids may provide one or more hydrogen ions as they are deprotonated. An acid that provides only a single hydrogen ion is referred to as a(n) _____ acid. Acids that contribute multiple hydrogen ions are called _____ acids. When acids contribute multiple hydrogen ions, they are removed one at a time and each hydrogen ion is _____ to remove.
13. Write the deprotonation sequence for arsenic acid, H_3AsO_4 .
- Step 1: _____
- Step 2: _____
- Step 3: _____
14. Substances that may act as either an acid or a base are called _____ substances. _____ is probably the most common of these substances, but _____ and _____ are also examples.

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15. Define

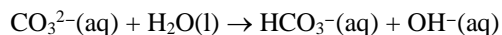
a. conjugate base: _____

b. conjugate acid: _____

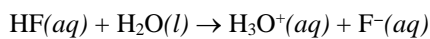
16. How does an acid differ from its conjugate base? _____

17. How does a base differ from its conjugate acid? _____

18. Determine the acid-base conjugate pairs for the following reaction:



19. Determine the acid-base conjugate pairs for the following reaction:



20. Strong acids have _____ conjugate bases. Weak bases have _____ conjugate bases. Strong bases have _____ conjugates acids. Weak bases have _____ conjugate bases.

21. In neutralization reactions the products will include _____ and _____. Carbonates and hydrogen carbonates will also produce _____. SO_2 gas may be produced in neutralization reactions if _____ or _____ ions are present.